Atlantic Richfield Company

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Via E-Mail and Federal Express

Docket Coordinator, Headquarters
U.S. Environmental Protection Agency
CERCLA Docket Office
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RE: Docket ID No. EPA-HQ-SFUND-2015-0139
NPL Listing Proposal for Anaconda Aluminum Co. Columbia Falls Reduction Plant: Comments of Atlantic Richfield Company

Dear Docket Coordinator:

Atlantic Richfield Company ("Atlantic Richfield") submits these comments in response to the Environmental Protection Agency's ("EPA") proposal to add the following site to the CERCLA National Priorities List ("NPL"): Anaconda Aluminum Co. Columbia Falls Reduction Plant, Columbia Falls, Montana (the "Site"). *See* 80 Fed. Reg. 15972 (Mar. 26, 2015) (the "Proposed Rule"). For the reasons discussed below and in the attached report, EPA should not proceed with listing of the Site on the NPL.

EPA relies on data and conclusions presented in the Hazard Ranking System ("HRS") Documentation Record[1] and Site Reassessment Report[2] (collectively "the HRS Package") to support the NPL listing proposal. Listing should be rejected because this information fails to establish a valid basis for a HRS Site Score above the NPL eligibility threshold of 28.50. In addition, the facility owner—Columbia Falls Aluminum Company, LLC ("CFAC"), a wholly-owned subsidiary of Glencore AG ("Glencore")—has publicly stated its willingness to investigate the Site and assess the nature and extent of public health and environmental risks associated with any releases of hazardous substances.[3] Under these circumstances, listing is unnecessary since it will not result in a more prompt or effective cleanup.

[1] http://www.epa.gov/superfund/sites/docrec/pdoc1904.pdf
[2] Site Reassessment Report for Columbia Falls Aluminum Company Aluminum Smelter Facility, Columbia Falls, Flathead County, Montana. Prepared for US EPA Region 8. Prepared by Weston Solutions, Inc. April 4, 2014. http://www2.epa.gov/region8/columbia-falls-site-reassessment-report
[3] As stated in the preamble to the Proposed Rule, "[t]he NPL is intended primarily to guide the EPA in determining which sites warrant further investigation to assess the nature and extent of public health and environmental risks associated with a release of hazardous substances, pollutants or contaminants." 80 Fed. Reg. 15972, 15974

I. Summary Of The Key Points In The CEC Technical Report

On behalf of Atlantic Richfield, Copper Environmental Consulting LLC ("CEC") reviewed the HRS Package, and the underlying assumptions and methodologies used by EPA's consultant, Weston, in scoring the Site. CEC's technical report is attached to this letter as Exhibit A. Based on corrected data inputs and other adjusted assumptions and methodologies that more accurately reflect conditions, exposure pathways, and potential risks at the Site (as described in detail in the CEC report), CEC calculated a revised HRS Site Score of 25.6, which is less than the NPL eligibility threshold of 28.50. As CEC points out in detail in its technical report, the analysis presented in the HRS Documentation Record is flawed for multiple reasons and cannot support EPA's calculated HRS Site Score of 68.39.

Besides re-calculating the HRS Site Score, CEC has identified other significant omissions and problems with the record EPA assembled in the HRS Package, as summarized below.

A. *The Groundwater Pathway Score is Unreliable Because of Errors in Data Collection and Methodology Related to the Residential Well Cyanide Sample*

1. The "targets" component of the Groundwater Migration Pathway score and the overall HRS score are largely driven by a single residential well sample collected in October 2013 in the Aluminum City area—from well CF-GW-OP-02—showing a cyanide concentration above the detection limit, but below the EPA maximum contaminant level ("MCL") for drinking water. It is highly likely, however, that the cyanide result gathered from CF-GW-OP-02 in October 2013 was an analytical error or an anomalous result, because: (a) during two subsequent rounds of EPA sampling in April 2014 and November 2014, cyanide was not detected in any Aluminum City residential wells, and no other constituents were measured above regulatory benchmarks or risk-based screening levels; and (b) cyanide analytical results are frequently anomalous due to interference from sample preservatives and background chemical constituents.

2. Even if cyanide is present in groundwater at or near the Site, other sampling results presented in the Site Reassessment Report show it is likely a background condition unrelated to releases from the Site. For example: (a) cyanide was detected in background groundwater samples collected upgradient of the Site above Cedar Creek Reservoir; (b) cyanide was also detected in background surface water samples collected from the Flathead River upstream of the Site at concentrations significantly greater than Flathead River samples below the Site; (c) monitoring wells along the potential groundwater flow paths (MW-08 and MW-09) below the West Landfill contained cyanide concentrations less than the background well (MW-15); and (d) cyanide has not been detected in other residential wells in Aluminum City located in the immediate vicinity of well CF-GW-OP-02.

B. *The Groundwater to Surface Water Migration Component Suffers from Incomplete Methodology, and Generally Fails to Support a Conclusion of Environmental or Other Risk*

1. The groundwater-to-surface-water migration score relies on manganese concentrations measured at single sample location within a backwater area of the Flathead River—at CF-SW-07, which is immediately downgradient from CFAC's permitted discharge at Outfall 006 (MPDES Permit No. MT0030066). Results collected at this location do not establish that elevated manganese concentrations are present in groundwater at the Site, or that groundwater discharges from the Site are adversely affecting surface water quality in the Flathead River. For example:

- Measured total manganese concentrations at CF-SW-07 ranged from 27.1-27.3 μg/L. These levels are essentially equal to the calculated "three times background" total manganese concentration of 26.7 μg/L;

- Total manganese concentrations measured in two Flathead River samples collected just downstream from CF-SW-07—at SW-05 and SW-06—were below the average Flathead River background concentration of 5.2 μg/L for total manganese;

- Total manganese concentrations measured at CF-SW-07 were less than the background total manganese concentration measured in Cedar Creek at SW-01 (32.9 μg/L); and

- Manganese concentrations measured at CF-SW-07 were less than background groundwater manganese concentrations measured upgradient from the Site at CF-GW-MW-01.

2. EPA's assumptions about groundwater flow paths, which are used to support the groundwater-to-surface-water migration component, are also internally inconsistent and unsupported by groundwater elevation measurements. EPA assumes that a groundwater "ridge" must be present south of the Site—between the Site and the Flathead River. In theory, this ridge supports EPA's conceptual site model by forcing the alluvial groundwater to flow beneath the majority of potential on-site sources towards the southwest in the direction of the Aluminum City residential well and parallel to the Flathead River. But there are no groundwater elevation data reported in the HRS Package to support the presence of a groundwater ridge in this area. Nor is its presence consistent with EPA's own conclusions regarding the groundwater-to-surface-water pathway, which assumes that groundwater must flow due south from the Site towards the Flathead River.

3. Even if the methodology for scoring the manganese results were reliable (which it is not), the presence of manganese at these levels does not establish any risk to

human health and the environment that would justify listing this Site. Manganese is an essential nutrient for human health, a vital micro-nutrient, and a non-priority pollutant. Further, EPA recommends a manganese human health water quality criterion of 50 μg/L, which exceeds the highest manganese concentration measured in the Flathead River. Moreover, the EPA criterion is "not based on toxic effects, but rather is intended to minimize objectionable qualities such as laundry stains and objectionable tastes in beverages."[4] Neither EPA nor Montana has established an aquatic life criterion for manganese.

4. EPA's methodology of using the lowest Reference Dose ("RfD") for manganese for the groundwater-to-surface-water pathway should be revised. If EPA is going to use manganese to establish a groundwater-to-surface-water pathway, a pathway-specific toxicity value that is consistent with oral exposure to surface water (not inhalation) should be used to reassess the score. EPA uses an inhalation RfD of 0.000014 mg/kg/day, which is orders of magnitude more conservative than the oral RfD of 0.14 mg/kg/day. EPA then compounds this error by using a reference concentration ("RfC") that incorrectly assumes 100% of the manganese present in the inhaled particulate is absorbable. This methodology is not appropriate for assessing potential risk posed by a non-priority pollutant in surface water. It fails to distinguish sources based on the pathway at issue, and it significantly mischaracterizes manganese toxicity.

C. *Estimated Hazardous Waste Quantities in the Percolation Ponds are Significantly Overstated*

1. The Tier D (area) method used by EPA to estimate Hazardous Waste Quantity ("HWQ") is the least rigorous method allowed. *See Hazardous Ranking System Guidance Manual*, at Section 6.5 (EPA 1992). In this case, the method greatly overestimates the amount of waste disposed in the percolation ponds. For example, to reconcile the Tier D method results with actual concentrations of cyanide and arsenic collected from the sediment samples in the percolation ponds, volumes of both contaminants in the percolation ponds would need to be 20 to 60 feet deep. EPA's approach is unrealistic given what is known about the Site and the facility's operations.

2. The best available data was not used to estimate hazardous waste quantities in the percolation ponds. Because waste stream discharges to the percolation ponds were permitted under State of Montana discharge permits, discharge quantities should not have been estimated as described in the HRS Package, but instead determined from empirical measurements available in CFAC's discharge monitoring reports.

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[4] National Recommended Water Quality Criteria. http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm#gold.

D. *<u>Other Errors are Evident in the HRS Package</u>*

1. The Human Food Chain Threat score of 96 out of 100 is biased high. The HRS Package uses an inappropriate HWQ factor (see above) and an inappropriate food chain individual factor based on incorrect assumptions about, and methodologies for, manganese (see above).

2. The Environmental Threat score of 60 out of 60 is also biased high. The HRS Package uses an inappropriate HWQ factor (see above) and an inappropriate Level II Concentration factor rather than a Potential Concentration factor. A more appropriate background manganese concentration would result in a significantly lower "Targets" factor in the Environmental Threat.

3. EPA recognizes that using a groundwater-to-surface-water pathway for NPL listing requires a "special case," which does not exist here. Historically, EPA has applied this "special case" particularly to support listing of coal gas facilities where waste is buried deep, but adjacent to rivers/waterways, and polyaromatics are leaked into the surface water.[5] Those characteristics are not present at this Site, and the methodologies and conclusions supporting the groundwater-to-surface-water pathway in the HRS Package are inadequately supported by data, rendering EPA's conclusions insufficient and unreliable.

As the CEC report demonstrates, there are multiple, serious flaws with the HRS score at this Site—two of the more significant being: (1) improper conclusions drawn from a single, residential well cyanide sample that has not been repeated in subsequent sampling and is more likely than not an analytical error; and (2) inappropriate conclusions drawn about the potential groundwater-to-surface-water pathway from a single manganese sample location. These and the other flaws noted in the CEC report cast serious doubt upon EPA's underlying technical rationale for the listing proposal. Because of these technical deficiencies, listing is premature or not warranted at all.

II. EPA Should Not List The Site Because The Current Owner Is Willing To Perform The RI/FS

CFAC, as the Site owner, is a viable entity, which has publicly expressed a willingness to perform the CERCLA RI/FS. CFAC has offered to enter into a binding administrative order on consent to perform the RI/FS, developed an investigatory plan, and hired a contractor that would work with EPA to implement the plan.

CFAC is a wholly owned subsidiary of Glencore, which identifies itself as "one of the world's largest diversified natural resource companies and a major producer and marketer of

[5] EPA HRS Training Course, Section 15: Overview.
http://www.epa.gov/superfund/training/hrstrain/htmain/15over.htm

over 90 commodities worldwide."[6] Glencore has been publicly involved in recent discussions among CFAC, EPA, and the Montana Department of Environmental Quality about plant operations, Site investigations, decommissioning, and future redevelopment. Glencore's ownership of CFAC should allay any concerns EPA may have about CFAC's longevity or the potential need to access the Superfund.

Under these circumstances, NPL listing is unnecessary to ensure timely and effective site investigations or adequate funding for future response actions. *See* 42 U.S.C. § 9604(a)(1) ("When the President determines that such [remedial or removal] action will be done properly and promptly by the owner or operator of the facility or vessel or by any other responsible party, the President may allow such person to carry out the action, conduct the remedial investigation or conduct the feasibility study in accordance with section 9622 of this title.").

Furthermore, as the Site owner, CFAC has incentive to promptly and comprehensively complete the response actions required at the Site, since it alone will benefit from redevelopment of the property—only a portion of which is part of the industrial facility.[7] In this respect, CFAC will determine reuse goals and site restrictions appropriate to support redevelopment, which will be accelerated by prompt investigation and cleanup.

In the unlikely event CFAC's efforts to carry out the RI/FS and cleanup are not successful, EPA retains the authority and discretion to list the Site on the NPL in the future, including after completion of the RI/FS, if needed. At that time, the more specific information necessary to assess whether contamination presents a substantial risk to human health and the environment would be developed and available. As a matter of policy and sound science, deferring listing now and developing a better information base is preferable to proceeding with listing with incomplete, incorrect, and unreliable information.

III. EPA Can Achieve Its Desired Goals Without Listing The Site On The NPL

Section 105 of CERCLA, 42 U.S.C. § 9605, establishes a strong preference for identifying, and prioritizing for NPL listing, those sites that present danger to the public health or welfare, and risk to human health and the environment. *See also* 40 C.F.R. § 300.425(c) (establishing the criteria for NPL listing, including those sites that pose significant threats to public health). By virtue of its very name the National "*Priorities*" List should be used to prioritize those sites presenting the most serious risks to public health and the environment and for which EPA's power to obtain an alternative funding source or to compel PRPs to participate is needed

[6] http://www.glencore.com/who-we-are/. According to its website, Glencore plc employs 181,000 people and reported revenue of $224 billion in 2014.

[7] *See* Richard Hammer, *Glencore permanently closes CFAC site*, Hungry Horse News, March 3, 2015, (available at http://www.flatheadnewsgroup.com/hungryhorsenews/glencore-permanently-closes-cfac-site/article_63e31b30-c1c5-11e4-b4a3-43a2aec3a719.html) ("While [the decision to permanently close the plant] marks the end of aluminum production in Montana, it also paves the way for the possibility of finding alternative uses for the strategic property. This is the next step in making the property productive once again, and CFAC remains open and committed to procuring redevelopment interest.")

because the current owner(s) are not willing or able to perform investigatory and cleanup activities. For the reasons discussed above and in the CEC report, EPA has not yet demonstrated, based on reliable, technical information, that this Site poses a priority risk to public health and the environment. And CFAC has already publicly committed to addressing contamination at the Site.

Furthermore, EPA recognizes that alternatives to NPL listing may be preferred and can be highly effective in the right circumstances. *See e.g.*, 40 C.F.R. § 300.425(a)(2) ("EPA may also pursue other appropriate authorities to remedy the release, including enforcement actions under CERCLA and other laws."). Alternative approaches to NPL listing also can provide the same benefits as NPL listing. For example, under EPA guidance, CERCLA settlement authority leading to remedial action at a non-NPL site may be used when the following criteria are met: (1) the site would qualify for listing on the NPL; (2) the site is expected to need remedial action; and (3) there is a viable, capable, and cooperative PRP willing to enter an enforceable agreement with EPA and perform the remedial work. *See Updated Superfund Response and Settlement Approach for Sites Using the Superfund Alternative Approach (SAA Guidance), OSWER Dir. No. 9200.2-125* (Sept. 28, 2012). Here, CFAC is a capable PRP, and it has publicly expressed its willingness to negotiate and sign an agreement to perform the investigation or cleanup. In addition, EPA's SAA guidance ensures that the remedy and overall quality of the cleanup meet substantially the same criteria as if a site were NPL listed. *See Superfund: EPA Should take Steps to Improve its Management of Alternatives to Placing Sites on the National Priorities List*, Government Accountability Office Report to Congressional Requesters, GAO 13-252, at 23 (April 9, 2013). The RI/FS and cleanup at a non-listed site may use the same investigation, cleanup processes, response techniques, standards, etc., as for an NPL site. *Id*. And non-listed sites can also eventually achieve cleanup levels that are comparable to those required at NPL sites. *Id*.

Because the applicable criteria are met here, EPA should pursue investigation and cleanup of the Columbia Falls Site without listing it on the NPL.

IV. Corrections To Misstatements Of Fact In The HRS Report Regarding Atlantic Richfield's History And Involvement At The Site

The HRS document, on page 21, incorrectly states that "ARCO purchased the plant in 1978 and operated it until 1985 when it was sold to the Montana Aluminum Investor's Corporation and began operations under Anaconda Aluminum Co. Columbia Falls Reduction Plant."

Atlantic Richfield did not purchase the Columbia Falls plant. Rather, in 1981, Atlantic Richfield completed a merger with the Anaconda Copper Mining Company, which owned and operated the Columbia Falls facility through an operating division known as Anaconda Aluminum. In 1985, CFAC was organized as a Montana corporation. Atlantic Richfield transferred the Columbia Falls facility business to CFAC and then transferred all of the authorized capital stock of CFAC to Montana Aluminum Investor's Corp. ("MAIC"), a company formed and owned by several of the facility's senior managers. In 1988, MAIC merged into CFAC. In 1991, Glencore acquired CFAC, which continued to operate as a Glencore subsidiary.

V. Conclusion

The Site does not qualify for NPL listing under EPA's protocols and should not be listed on the NPL. The HRS Package and the underlying technical record are incomplete and contain overly-conservative assumptions and inappropriate methodologies and conclusions. When revised to incorporate available data and other information, the HRS scoring fails to demonstrate a level of potential environmental or human health risk that warrants listing. Simply put, this is not a "priority" site.

Much of the HRS score is driven by a single erroneous cyanide sample that has not been replicated. Subsequent sampling from the same location detected no cyanide or other constituents of concern at concentrations above risk-based screening levels. And the conclusions regarding the groundwater-to-surface-water pathway from a single manganese sample location are belied by other evidence on the record and EPA's own acknowledgement that manganese is not a priority pollutant. Other aspects of HRS Package suffer from similar flaws, which result in a score that is not reflective of actual site conditions or potential environmental or human health risk. EPA's decision to list the Site based upon the HRS Package would be arbitrary and capricious and not in accord with CERCLA and the NCP.

The Site owner is a willing, viable PRP, which has already taken significant steps to address contamination at the Site—including hiring a consultant to investigate the Site, forming a Community Liaison Panel, and contracting for the demolition of major buildings to prepare for re-development. Accordingly, CERCLA's statutory preference for prompt and quick investigation and cleanup through a viable and capable PRP is met, and investigation and cleanup should proceed outside the CERCLA NPL listing process. CFAC is uniquely positioned to define the property's reuse goals and complete the RI/FS. For these reasons, NPL listing of the Site is both unnecessary to protect human health and the environment and unwarranted based upon the technical record.

Atlantic Richfield appreciates EPA's careful consideration of these comments as it completes the Site listing analysis. Please contact the undersigned with any questions about this letter or the attached report.

Sincerely,

Patricia Gallery

Patricia Gallery
Vice President, Atlantic Richfield Company

cc: Cord Harris
Rebecca Raftery, Esq.

Enclosure: CEC Technical Report

EXHIBIT A

Docket ID No. EPA-HQ-SFUND-2015-0139
NPL Listing Proposal for Anaconda Aluminum Co. Columbia Falls Reduction Plant:
Comments of Atlantic Richfield Company

Copper Environmental Consulting

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TECHNICAL REPORT

PREPARED BY: Copper Environmental Consulting

SUBJECT: Review of the Columbia Falls Aluminum Company, LLC (CFAC), HRS Documentation Record

DATE: May 19, 2015

Introduction

This Technical Report has been prepared by Copper Environmental Consulting "CEC" as a summary of our review of the US Environmental Protection Agency (US EPA) Hazard Ranking System (HRS) scoring for the CFAC Site "Site" (Weston 2015). This report summarizes key issues associated with the assumptions and methodology used by Weston that can produce an erroneous or overly conservative HRS score. We have also calculated a revised HRS score using additional data obtained from the US EPA from a resampling event and using appropriate site-specific assumptions.

The primary source of data for the HRS scoring was the Site Reassessment Report (Weston 2014). Additional sampling data collected by the US EPA in November 2014 in the Aluminum City area was also reviewed as part of this Technical Report.

Hazardous Waste Quantity Estimates

The Hazardous Waste Quantity (HWQ) factors for all waste locations evaluated at this Site were calculated by the scorers using the area based (Tier D) method. This method is the least rigorous of the four methods available to the scorers and requires the least amount of data. In fact, the scorer only needs to identify the footprint of the potential source area and choose a source type (e.g., pile, surface impoundment, landfill, etc.). In this instance, the Tier D method greatly overestimates the amount of waste disposed in the percolation ponds, and US EPA should have used additional data associated with the permitted discharges to more accurately approximate the mass of waste disposed. As an example, using the Tier D method, an acre of "Surface Impoundment" is equivalent to 3,350 pounds of a pure hazardous substance (e.g. 100% cyanide or 100% arsenic), which is unreasonable because sediment samples collected in the percolation ponds showed an average cyanide concentration of 42 mg/kg and an average arsenic concentration of 15 mg/kg which would equate to a depth of contamination, at these concentrations, to 20 to 60 feet.

Further, US EPA did not use data that supports "the most accurate estimate of hazardous waste stream quantity" (USEPA 1992). Waste streams to the Percolation Ponds were permitted discharges to ground water and surface water by the State of Montana. It is a requirement of these permits to report to the State of Montana, on a monthly basis, the amount and quality of process water discharged (MDHES 1984, MDEQ 1999, MDEQ 2014). Therefore, discharge monitoring reports "DMRs" should have been used when estimating the waste quantity discharged.

The hazardous waste quantities should be recalculated based upon the most accurate existing available information and incorporated into the calculations. If DMRs are not available, more realistic assumptions of the vertical extent of waste within at least the percolation ponds should be developed.

Ground Water Migration Pathway Score

US EPA describes the Alluvial/Glacial aquifer underlying the Site as "interconnected deposits" with "no evidence of aquifer discontinuities between the Site and the target wells along the river valley." A groundwater seep is present immediately south of the Site on the Flathead River and discharges groundwater migrating beneath the Site. This seep is immediately upstream of the Flathead River sampling location shown as station SW-07 on the HRS Document Record Figure 4, and is also a permitted discharge by the State of Montana (MDEQ 2014). However, the Site Reassessment Report (Weston 2014) and the HRS Document Record (Weston 2015) both show a potentiometric contour map[1] that suggests a groundwater "ridge" that would force the alluvial groundwater flowing beneath the majority of source areas to flow parallel to the river towards Aluminum City rather than to the river. Additionally, the potentiometric groundwater contours were created using groundwater elevation data from alluvial wells with significantly differing depths. The groundwater elevations from such wells, measured as part of the Site Reassessment, indicate vertical gradients are present that influence groundwater flow directions within this aquifer. In sum, the information provided in the documents developed by or for EPA does not support EPA's inference that a groundwater ridge is present, and the potentiometric groundwater contours should be revised accordingly.

Although groundwater contamination is evident immediately adjacent to some of the source areas (West Landfill and West Percolation Pond), based on the Site Reassessment total metals data, groundwater samples further downgradient (~2,000 ft) from these sources do not show a significant impact above background (i.e., not greater than three-times background).

The "Targets" component of the Groundwater Migration Pathway score is driven by a single Aluminum City residential well sample (CF-GW-OP-02) collected in October 2013 with a cyanide concentration above the detection limit. However, subsequent sampling of the Aluminum City residential wells in April

[1] The elevations for all groundwater monitoring locations used to create the potentiometric contours in the Site Reassessment Report were estimated rather than surveyed (See Weston 2014, Appendix C, Table C2). Therefore, any groundwater elevation calculated or potentiometric surface generated from these estimates is questionable. All groundwater monitoring locations should be surveyed prior to identifying potential groundwater migration pathways.

2014 and November 2014 did not show cyanide above the detection limit, and no contaminants were detected above regulatory benchmarks or risk-based screening levels. According to the HRS Guidance Manual (US EPA 1992), additional sampling should be completed "to replace low-quality chemical analysis data that support observed releases, and/or the calculation of target exposed to actual contamination." We assume that the additional sampling that was completed in November 2014 by the EPA contractor was in response to uncertainty associated with the initial sample results for residential wells in the Aluminum City area.

As shown on attached Figure 1, Cyanide was also detected in the background samples in the Flathead River (SW-13 at 120 ug/L, SW-14 at 111 ug/L, and SW-16 at 96-106 ug/L) upstream of the Site at concentrations significantly greater than Flathead River samples below the Site (SW-06 at <10 ug/L and SW-05 at 4.5 ug/L). Cyanide was also detected in the background groundwater upgradient of the Site above Cedar Creek Reservoir (MW-01 at 18.5 ug/L). If cyanide was migrating from the West Landfill through the alluvial aquifer, it is reasonable to expect intermediate cyanide concentrations along the groundwater flow path and in adjacent monitoring wells to the residential well where cyanide was detected; yet, this was not the case based on the available analytical results. The monitoring wells along the potential groundwater flow paths (MW-08 and MW-09) from the West Landfill had cyanide concentrations less than the background well (MW-15) and the monitoring wells adjacent to the residential well did not have detectable concentrations of cyanide.

Considering that the cyanide concentration observed in well CF-GW-OP-02 was not confirmed with resampling (or even detected) in subsequent sampling rounds, combined with the fact that surrounding wells have cyanide concentrations below detection or below background concentration, further supported by the fact that the cyanide concentrations upgradient of the site in the Flathead River are greater than the cyanide concentrations downstream of the site, it is highly probable that the initial cyanide result at CF-GW-OP-02 was an analytical error and not an indication of actual groundwater migration between the landfill and the Aluminum City well.

The following points further substantiate this position:

- Appendix F of the Site Reassessment Report (Weston 2014) indicates that many cyanide analyses were performed one to four days beyond the 14-day holding time. Additionally, the relative percent difference (RPD) for cyanide in at least one field duplicate set exceeded the reasonable control limit. Likewise, the matrix spike recovery for cyanide in at least one data set was below the control limit. These significant deviations from the EPA's data quality protocols render the data to be unrepresentative of the actual sample concentrations.
- Cyanide analysis contains many known interferences, including the preservative, sodium hydroxide (Giudice et al. 2011), and some background constituents such as nitrate/nitrite (Carr et al, 1997). Although nitrate/nitrite was analyzed in the majority of all samples collected in this sampling event, nitrate/nitrite was not analyzed in this particular ground water sample (CF-GW-OP-02).

Based on the information described above, the "Targets" component score on the Groundwater Migration Pathway Scoresheet should be revised to reflect the cyanide results from the follow up sampling rather than the initial sample.

Ground Water to Surface Water Migration Component Score

The groundwater to surface water migration component score relies on a single sample (CF-SW-07) where manganese was detected above background within a backwatered area of the Flathead River. This sample location was immediately down gradient from a groundwater seep area that is a permitted discharge (Outfall 006) in the current CFAC MPDES permit (MDEQ 2014). This permit includes a chronic mixing zone within the Flathead River downstream from this outfall. No other constituents were detected above the background concentrations within the Flathead River.

The total manganese concentration at this location (27.1-27.3 ug/L) was well within an acceptable sampling/analytical error above the calculated "three times background" concentration of 26.7 ug/L. The Flathead River samples collected immediately downstream from this location (SW-05 and SW-06) had total manganese concentrations (1.4-2.6 ug/L) that were below the average Flathead River background (5.2 ug/L) concentration above the Site, thus indicating that the Site groundwater is not impacting the Flathead River.

Additionally, as shown on attached Figure 2, the total manganese concentration at this location (CF-SW-07) was less than the Cedar Creek background sample (SW-01 @ 32.9 ug/L) and less than the average groundwater background concentration upgradient from the Site (CF-GW-MW-01 @ 75.7 ug/L). It is reasonable to assume that the CF-SW-07 sample is comprised of a significant amount of alluvial groundwater discharging to this backwatered area of the Flathead River and the results from CF-SW-07 should not only be compared to the Flathead River background samples, but also the alluvial groundwater background samples.

The US EPA should be consistent with how it classifies manganese. Although the HRS treats manganese as a hazardous substance, US EPA has identified manganese as an essential nutrient for human health (US EPA 2007) as well as a "vital micro-nutrient" for flora and fauna (US EPA 1986), and US EPA has categorized manganese as a "Non Priority Pollutant" (US EPA 1986). US EPA has established a recommended manganese human health water quality criterion of 50 ug/L and has indicated that this criterion is "not based on toxic effects, but rather is intended to minimize objectionable qualities such as laundry stains and objectionable tastes in beverages" (US EPA 2015a). Neither the US EPA nor the State of Montana (MDEQ 2012) have established an aquatic life criterion for manganese.

With respect to toxicity, the HRS treats manganese similarly to priority pollutants (e.g., mercury, arsenic, cadmium) even though the factors used to calculate toxicity (via Table 2-4 of the HRS documentation) for the pathways identified are significantly lower. For instance, the Oral Reference Dose (RfD) for manganese is 0.14 mg/kg/day, the Oral LD50 is 56 mg/kg, and the Dermal LD50 is 50 mg/kg (USEPA 2014) which, at most, equate to a toxicity factor of 10. However, the Superfund Chemical Data Matrix "SCDM" methodology indicates that the USEPA use the most stringent RfD regardless of pathway, which for manganese is the inhalation RfD of 0.000014 mg/kg/day (four orders of magnitude less than the oral RfD). Additionally, the inhalation RfD is a calculated value based on the reference concentration (RfC) with the assumption that 100% of the manganese present in the inhaled particulate is absorbable (US EPA 2014). Because these exposure pathways have vastly different RfDs, the methodology of using the lowest RfD should be revised to accurately represent the risk by pathway. This mischaracterization of toxicity for manganese within the HRS results in a much higher HRS score than is appropriate for a "Non-Priority Pollutant".

Since the CF-SW-07 sample location is likely dominated by groundwater flowing from north to south across the Site, the score should be recalculated assuming background is represented by the Flathead River, Cedar Creek, and groundwater background concentrations. Additionally, a pathway specific toxicity value should be used during the recalculation of the score for this component.

Human Food Chain Threat

The Human Food Chain Threat score of 96 out of 100 is biased high because the scorers used an inappropriate hazardous waste quantity factor, and an inappropriate food chain individual factor. The rationale regarding the first inappropriate factor is described above. The latter inappropriate factor, food chain individual factor, was chosen based on the assumption that the manganese concentration detected at SW-07 was significantly above background and that manganese was present at a Level II concentration within a fishery. If a more appropriate background manganese concentration (based upon the Flathead River, Cedar Creek, and upgradient groundwater background concentrations) had been used, the food chain individual factor would have then been solely based on the potential for contamination and resulted in a significantly lower score.

Environmental Threat

The Environmental Threat score of 60 out of 60 is biased high because the scorers used an inappropriate hazardous waste quantity factor, and an inappropriate Level II Concentration factor rather than a Potential Concentration factor. Similar to the Food Chain individual factor described in the previous paragraph, manganese measured at CF-SW-07 was identified by the scorers as significantly above background and at Level II concentrations. If the scorers had used a more appropriate background manganese concentration (based upon the Flathead River, Cedar Creek, and upgradient groundwater background concentrations), the Targets factor in the Environmental Threat score would have been significantly lower, thus resulting in a lower overall Environmental Threat score.

Revised HRS Site Score

A revised HRS Site score was calculated utilizing US EPA's HRS QuickScore software (US EPA 2015b). The following paragraphs provide a description of the adjustments that were made to the software input variables to rescore the Site. As revised, the software calculation produces an HRS score for the Site that recognizes the site specific conditions and known technical and scientific background information regarding site constituents of concern as described in the preceding sections of this Technical Report.

Hazardous Waste Quantity Estimates

Insufficient information is available about the Site to verify the quantity calculation or propose modification to this term. As such, the HWQ score remains unchanged. However, it is likely that use of either available or collected information about the site waste quantity will result in a lower HWQ score.

Therefore, the Site HWQ score remained unchanged at 10,000.

Ground Water Migration Pathway Score

Since contamination is present immediately down gradient from at least one source area, the "Observed Release" factor remained at 550 and the "Likelihood of Release" also remained at 550.

Cyanide was used to define the "Toxicity/Mobility" factor of 10,000; therefore, the "Waste Characteristics" factor remained unchanged at 100.

The "Nearest Well" factor was reduced from 50 to 20 based on the November 2014 resampling results that did not report a Level I concentration in any residential wells near the Site. A factor of 20 represents the nearest well within a distance of ¼ mile from the Site boundary (Table 3-11 of the USEPA 1990). The "Population" factor was reduced from 90 – based on Level I concentrations present – to 54.9 – based on Potential Contamination defined in Table 3-12 (USEPA 1990) and utilizing data from Tables 3 & 4 (Weston 2014). These modifications resulted in a "Targets" factor or 74.9 rather than 140.

These modifications, based entirely on the November 2014 resampling results, result in a Ground Water Migration Pathway score of 49.93 (compared to 93.33). The score would likely be lower if the HWQ was more accurately determined.

Ground Water to Surface Water Migration Pathway Score

Revised background concentrations were calculated for manganese using Flathead River background samples, Cedar Creek background samples, and upgradient groundwater background samples. Using these revised background concentrations, no observable release has occurred to the Flathead River. Therefore, the "observed release" factor was reduced from 550 to 0. The "Potential to Release" factors were modified based on "no liner" for "Containment" (factor =10 [Table 3-2 of USEPA 1990]), "Net Precipitation" factor equal to 3 (Table 3-4 of USEPA 1990), "Depth to Aquifer" factor equal to 3 (Greater than 25 to 250 ft [Table 3-5 of USEPA1990]), and a "Travel Time" factor equal to 25 (5 to 100 ft thick lowest hydraulic conductivity layer with hydraulic conductivity between 10^{-3} and 10^{-5} cm/s [Table 3-7 of USEPA 1990]). These factors equate to a "Likelihood of Release" factor of 310 (rather than 550 in the original score).

Human Food Chain Threat Score

The Likelihood of Release factor of 550 was reduced to 310 (see section above for discussion). The toxicity/mobility/persistence/bioaccumulation factor remained unchanged ($5x10^6$) based on the potential for release of cadmium. The HWQ factor also remained unchanged (10,000). Therefore, the "Waste Characteristics" factor remained unchanged (320).

The "Food Chain Individual" factor was reduced from 45 to 2 based on no observed release, a dilution weight of 0.001 (Table 4-13 of USEPA 1990), a dilution weight adjustment of 0.5 (Table 4-27 of USEPA 1990), and assuming a small to moderate stream for dilution (a conservative estimate given the flux of the Flathead River past the Site). The Level II concentration factor was reduced from 0.03 to 0, however, the Potential Human Food Chain Contamination factor was increased from 0 to 0.03. Therefore, the "Targets" factor was reduced from 45.03 to 2.03.

These modifications resulted in a Human Food Chain Threat score of 2.40 (compared to 96).

Environmental Threat Score

The Likelihood of Release factor of 550 was reduced to 310 (see section above for discussion). The toxicity/mobility/persistence/bioaccumulation factor remained unchanged ($5x10^6$) based on the potential for release of cadmium. The HWQ factor also remained unchanged (10,000). Therefore, the "Waste Characteristics" factor remained unchanged (320).

The "Level II Concentrations" factor was reduced from 150 to 0 because manganese was not present above the revised background concentration. However, the "Potential Concentrations" factor was increased from 0 to 7.5 based on the sensitivity of the environment rating (Table 4-23 of USEPA 1990). Therefore, the "Targets" factor was reduced from 150 to 7.5.

These modifications resulted in an Environmental Threat score of 9.01 (compared to 60).

Revised Site Score

Based on the modifications described above, the revised Site score is calculated to be 25.60 (compared to 68.39). According to US EPA's Hazard Ranking System Guidance Manual (USEPA 1992), the cutoff for listing the Site on the NPL is a score of 28.50. Copies of the revised HRS Quickscore output report and input files used in performing this calculation are included as Attachment 1.

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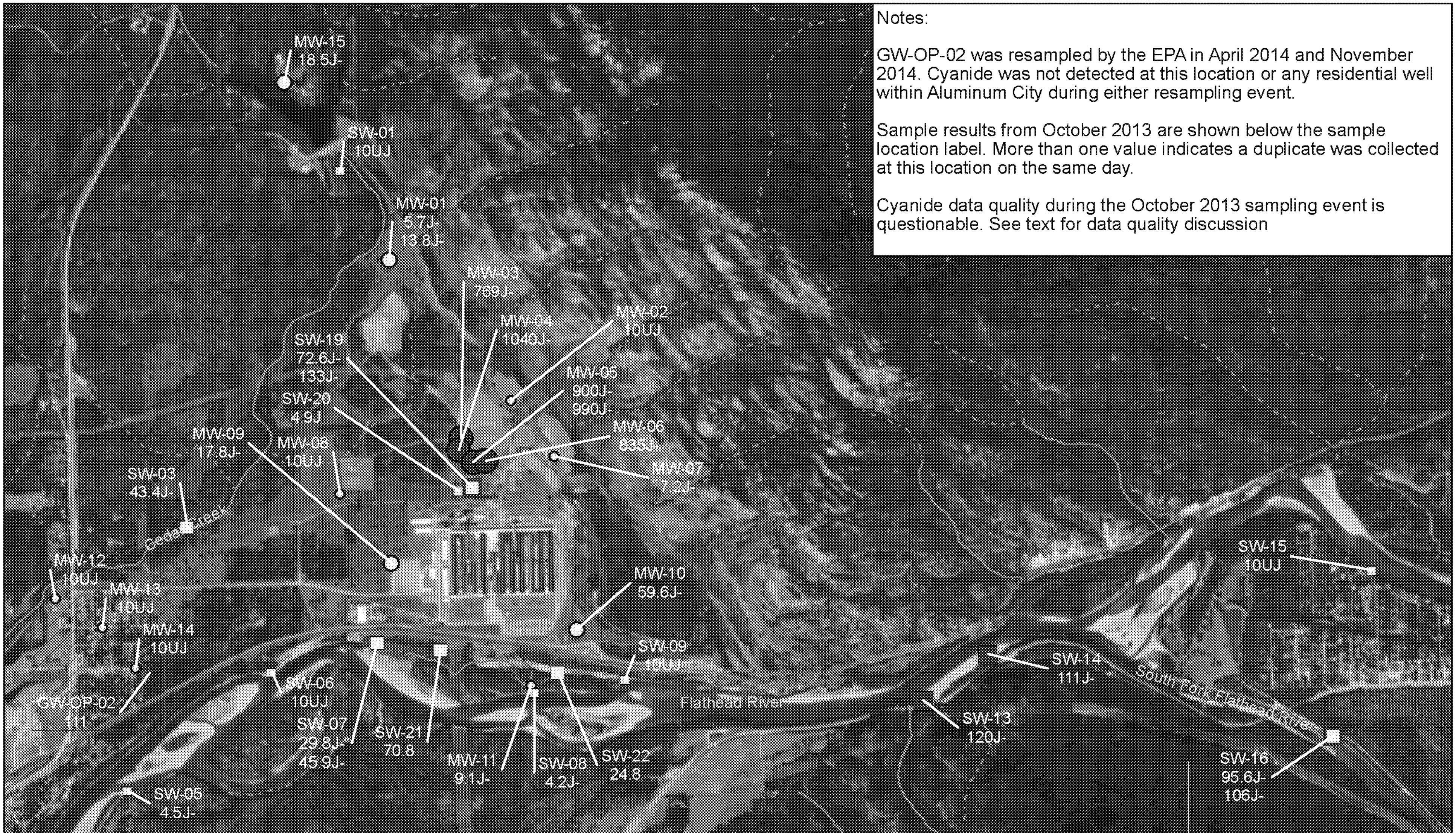
Notes:

GW-OP-02 was resampled by the EPA in April 2014 and November 2014. Cyanide was not detected at this location or any residential well within Aluminum City during either resampling event.

Sample results from October 2013 are shown below the sample location label. More than one value indicates a duplicate was collected at this location on the same day.

Cyanide data quality during the October 2013 sampling event is questionable. See text for data quality discussion



Legend

Surface Water

Total Cyanide (ug/L)

- <10
- 10 - 100
- >100

Ground Water

Total Cyanide (ug/L)

- <10
- 10 - 100
- >100

Aluminum City Resample Area

Site Features

N

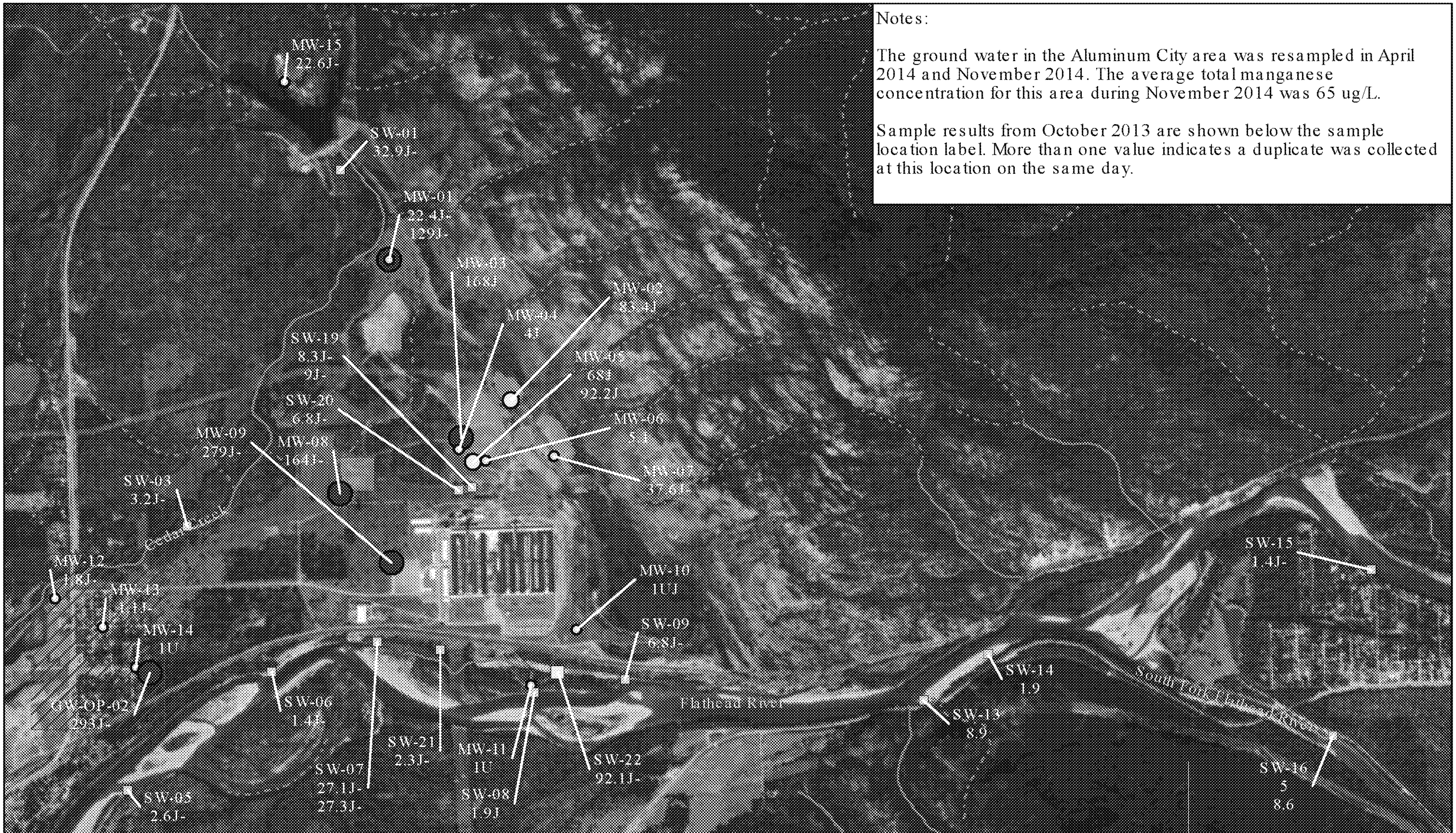
0 0.25 0.5 1 Miles

FIGURE 1

Cyanide Concentrations (Oct 2013) in
Surface Water and Ground Water
Columbia Falls Aluminum Company, LLC

Copper Environmental Consulting

DATE: 05/19/2015	BY: JJ	FOR: DM



Notes:

The ground water in the Aluminum City area was resampled in April 2014 and November 2014. The average total manganese concentration for this area during November 2014 was 65 ug/L.

Sample results from October 2013 are shown below the sample location label. More than one value indicates a duplicate was collected at this location on the same day.

Legend

Surface Water Total Manganese (ug/L)	Ground Water Total Manganese (ug/L)
< 50	< 50
50 - 100	50 - 100
> 100	> 100

Aluminum City Resample Area

Site Features

N

0 0.25 0.5 1 Miles

FIGURE 2

Manganese Concentrations (Oct 2013) in Surface Water and Ground Water
Columbia Falls Aluminum Company, LLC

Copper Environmental Consulting

DATE: 05/19/2015	BY: JJ	FOR: DM

Attachment 1
HRS Quickscore Output Report

Site Name: Columbia Falls Aluminum Company

Region: Region 8

Scenario Name: CEC Revised Analysis

City, County, State: Columbia Falls, Montana

Evaluator:

EPA ID#:

Date:

Lat/Long: 0:0:0,0:0:0

Congressional District:

This Scoresheet is for:

Scenario Name: CEC Revised Analysis

Description:

	S pathway	S^2 pathway
Ground Water Migration Pathway Score (S_{gw})	49.93	2493.0
Surface Water Migration Pathway Score (S_{sw})	11.41	130.19
Soil Exposure Pathway Score (S_s)	0.0	0.0
Air Migration Score (S_a)	0.0	0.0
$S^2_{gw} + S^2_{sw} + S^2_s + S^2_a$		2623.19
$(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		655.8
/ $(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		25.61

Pathways not assigned a score (explain):

Table 3-1 – Ground Water Migration Pathway Scoresheet			
Factor categories and factors	Maximum Value	Value Assigned	
Aquifer Evaluated: Alluvial/Glacial Combined			
Likelihood of Release to an Aquifer:			
1. Observed Release	550	550.0	
2. Potential to Release:			
2a. Containment	10	10.0	
2b. Net Precipitation	10	3.0	
2c. Depth to Aquifer	5	3.0	
2d. Travel Time	35	35.0	
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500	410.0	
3. Likelihood of Release (higher of lines 1 and 2e)	550		550.0
Waste Characteristics:			
4. Toxicity/Mobility	(a)	10000.0	
5. Hazardous Waste Quantity	(a)	10000.0	
6. Waste Characteristics	100		100.0
Targets:			
7. Nearest Well	(b)	20.0	
8. Population:			
8a. Level I Concentrations	(b)	0.0	
8b. Level II Concentrations	(b)	0.0	
8c. Potential Contamination	(b)	54.9	
8d. Population (lines 8a + 8b + 8c)	(b)	54.9	
9. Resources	5	0.0	
10. Wellhead Protection Area	20	0.0	
11. Targets (lines 7 + 8d + 9 + 10)	(b)		74.9
Ground Water Migration Score for an Aquifer:			
12. Aquifer Score [(lines 3 x 6 x 11)/82,5000][c]	100		49.93
Ground Water Migration Pathway Score:			
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]	100		49.93

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 4-1 --SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET			
Factor categories and factors	Maximum Value	Value Assigned	
Watershed Evaluated: Flathead River			
Drinking Water Threat			
Likelihood of Release:			
1. Observed Release	550	0.0	
2. Potential to Release by Overland Flow:			
2a. Containment	10	0.0	
2b. Runoff	10	0.0	
2c. Distance to Surface Water	5	3.0	
2d. Potential to Release by Overland Flow [lines 2a(2b + 2c)]	35	0.0	
3.Potential to Release by Flood:			
3a. Containment (Flood)	10	0.0	
3b. Flood Frequency	50	0.0	
3c. Potential to Release by Flood (lines 3a x 3b)	500	0.0	
4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500	0.0	
5. Likelihood of Release (higher of lines 1 and 4)	550		0.0
Waste Characteristics:			
6. Toxicity/Persistence	(a)	0.0	
7. Hazardous Waste Quantity	(a)	10000.0	
8. Waste Characteristics	100		0.0
Targets:			
9. Nearest Intake	50	0.0	
10. Population:			
10a. Level I Concentrations	(b)	0.0	
10b. Level II Concentrations	(b)	0.0	
10c. Potential Contamination	(b)	0.0	
10d. Population (lines 10a + 10b + 10c)	(b)	0.0	
11. Resources	5	0.0	
12. Targets (lines 9 + 10d + 11)	(b)		0.0
Drinking Water Threat Score:			
13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a max of 100]	100		0.0
Human Food Chain Threat			
Likelihood of Release:			
14. Likelihood of Release (same value as line 5)	550		0.0
Waste Characteristics:			
15. Toxicity/Persistence/Bioaccumulation	(a)	0.0	
16. Hazardous Waste Quantity	(a)	10000.0	
17. Waste Characteristics	1000		0.0
Targets:			
18. Food Chain Individual	50	0.0	
19. Population			
19a. Level I Concentration	(b)	0.0	
19b. Level II Concentration	(b)	0.0	
19c. Potential Human Food Chain Contamination	(b)	0.0	
19d. Population (lines 19a + 19b + 19c)	(b)	0.0	
20. Targets (lines 18 + 19d)	(b)		0.0
Human Food Chain Threat Score:			
21. Human Food Chain Threat Score [(lines 14x17x20)/82500, subject to max of 100]	100		0.0
Environmental Threat			
Likelihood of Release:			
22. Likelihood of Release (same value as line 5)	550		0.0
Waste Characteristics:			
23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	5.0E8	
24. Hazardous Waste Quantity	(a)	10000.0	
25. Waste Characteristics	1000		1000.0

Targets:			
26. Sensitive Environments			
26a. Level I Concentrations	(b)	0.0	
26b. Level II Concentrations	(b)	0.0	
26c. Potential Contamination	(b)	0.0	
26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	0.0	
27. Targets (value from line 26d)	(b)		0.0
Environmental Threat Score:			
28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a max of 60]	60		0.0
Surface Water Overland/Flood Migration Component Score for a Watershed			
29. Watershed Score[c] (lines 13+21+28, subject to a max of 100}	100		0.00
Surface Water Overland/Flood Migration Component Score			
30. Component Score (S_{sw})[c] (highest score from line 29 for all watersheds evaluated)	100		0

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 4-25 --GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORESHEET			
Factor categories and factors	Maximum Value	Value Assigned	
Watershed Evaluated: Flathead River			
Drinking Water Threat			
Likelihood of Release to an Aquifer:			
1. Observed Release	550	0.0	
2. Potential to Release:			
2a. Containment	10	10.0	
2b. Net Precipitation	10	3.0	
2c. Depth to Aquifer	5	3.0	
2d. Travel Time	35	25.0	
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500	310.0	
3. Likelihood of Release (higher of lines 1 and 2e)	550		310.0
Waste Characteristics:			
4. Toxicity/Mobility	(a)	0.0	
5. Hazardous Waste Quantity	(a)	10000.0	
6. Waste Characteristics	100		0.0
Targets:			
7. Nearest Well	(b)	0.0	
8. Population:			
8a. Level I Concentrations	(b)	0.0	
8b. Level II Concentrations	(b)	0.0	
8c. Potential Contamination	(b)	0.0	
8d. Population (lines 8a + 8b + 8c)	(b)	0.0	
9. Resources	5	0.0	
10. Targets (lines 7 + 8d + 9)	(b)		0.0
Drinking Water Threat Score:			
11. Drinking Water Threat Score ([lines 3 x 6 x 10]/82,500, subject to max of 100)	100		0.0
Human Food Chain Threat			
Likelihood of Release:			
12. Likelihood of Release (same value as line 3)	550	310.0	
Waste Characteristics:			
13. Toxicity/Mobility/Persistence/Bioaccumulation	(a)	5000000.0	
14. Hazardous Waste Quantity	(a)	10000.0	
15. Waste Characteristics	1000		320.0
Targets:			
16. Food Chain Individual	50	2.0	
17. Population			
17a. Level I Concentration	(b)	0.0	
17b. Level II Concentration	(b)	0.0	
17c. Potential Human Food Chain Contamination	(b)	0.0	
17d. Population (lines 17a + 17b + 17c)	(b)	0.0	
18. Targets (lines 16 + 17d)	(b)		2.0
Human Food Chain Threat Score:			
19. Human Food Chain Threat Score [(lines 12x15x18)/82,500,suject to max of 100]	100		2.4
Environmental Threat			
Likelihood of Release:			
20. Likelihood of Release (same value as line 3)	550		310.0
Waste Characteristics:			
21. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	5000000.0	
22. Hazardous Waste Quantity	(a)	10000.0	
23. Waste Characteristics	1000		320.0
Targets:			
24. Sensitive Environments			
24a. Level I Concentrations	(b)	0.0	
24b. Level II Concentrations	(b)	0.0	

24c. Potential Contamination	(b)	7.5	
24d. Sensitive Environments (lines 24a + 24b + 24c)	(b)	7.5	
25. Targets (value from line 24d)	(b)		7.5
Environmental Threat Score:			
26. Environmental Threat Score [(lines 20x23x25)/82,500 subject to a max of 60]	60		9.01
Ground Water to Surface Water Migration Component Score for a Watershed			
27. Watershed Score[c] (lines 11 + 19 + 28, subject to a max of 100)	100		11.41
28. Component Score (S_{gs})[c] (highest score from line 27 for all watersheds evaluated, subject to a max of 100)	100		11.41

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 5-1 --SOIL EXPOSURE PATHWAY SCORESHEET			
Factor categories and factors	Maximum Value	Value Assigned	
Likelihood of Exposure:			
1. Likelihood of Exposure	550		
Waste Characteristics:			
2. Toxicity	(a)	0.0	
3. Hazardous Waste Quantity	(a)		
4. Waste Characteristics	100		0.0
Targets:			
5. Resident Individual	50		
6. Resident Population:			
6a. Level I Concentrations	(b)	0	
6b. Level II Concentrations	(b)		
6c. Population (lines 6a + 6b)	(b)		
7. Workers	15	0.0	
8. Resources	5		
9. Terrestrial Sensitive Environments	(c)		
10. Targets (lines 5 + 6c + 7 + 8 + 9)	(b)		0.0
Resident Population Threat Score			
11. Resident Population Threat Score (lines 1 x 4 x 10)	(b)		0.0
Nearby Population Threat			
Likelihood of Exposure:			
12. Attractiveness/Accessibility	100	0.0	
13. Area of Contamination	100	5.0	
14. Likelihood of Exposure	500		0.0
Waste Characteristics:			
15. Toxicity	(a)	0.0	
16. Hazardous Waste Quantity	(a)	0.0	
17. Waste Characteristics	100		0.0
Targets:			
18. Nearby Individual	1	0.0	
19. Population Within 1 Mile	(b)		
20. Targets (lines 18 + 19)	(b)		
Nearby Population Threat Score			
21. Nearby Population Threat (lines 14 x 17 x 20)	(b)		0.0
Soil Exposure Pathway Score:			
22. Pathway Score[d] (S_s), [lines (11+21)/82,500, subject to max of 100]	100		0.0

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] No specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited to a maximum of 60
[d] Do not round to nearest integer

TABLE 6-1 --AIR MIGRATION PATHWAY SCORESHEET		
Factor categories and factors	Maximum Value	Value Assigned
Likelihood of Release:		
1. Observed Release	550	
2. Potential to Release:		
2a. Gas Potential to Release	500	
2b. Particulate Potential to Release	500	
2c. Potential to Release (higher of lines 2a and 2b)	500	
3. Likelihood of Release (higher of lines 1 and 2c)	550	
Waste Characteristics:		
4. Toxicity/Mobility	(a)	
5. Hazardous Waste Quantity	(a)	
6. Waste Characteristics	100	
Targets:		
7. Nearest Individual	50	
8. Population:		
8a. Level I Concentrations	(b)	
8b. Level II Concentrations	(b)	
8c. Potential Contamination	(c)	
8d. Population (lines 8a + 8b + 8c)	(b)	
9. Resources	5	
10. Sensitive Environments:		
10a. Actual Contamination	(c)	
10b. Potential Contamination	(c)	
10c. Sensitive Environments (lines 10a + 10b)	(c)	
11. Targets (lines 7 + 8d + 9 + 10c)	(b)	
Air Migration Pathway Score:		
12. Pathway Score (S_a) [(lines 3 x 6 x 11)/82,500][d]	100	

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] No specific maximum value applies to factor. However, pathway score based solely on sensitive environments is limited to a maximum of 60.
[d] Do not round to nearest integer